F-91

OPERATING INSTRUCTIONS

MODEL TTS 26BXP PULSING PANEL
ACCESSORY COVER FOR
MODEL TTS 26B PULSE SIGNALING TEST SET

CALIBRATION CHECK 6.1

NORTHEAST ELECTRONICS CORPORATION

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MODEL TTS 26BXP PULSING PANEL
ACCESSORY FOR MODEL TTS 26B PULSE SIGNALING TEST SET

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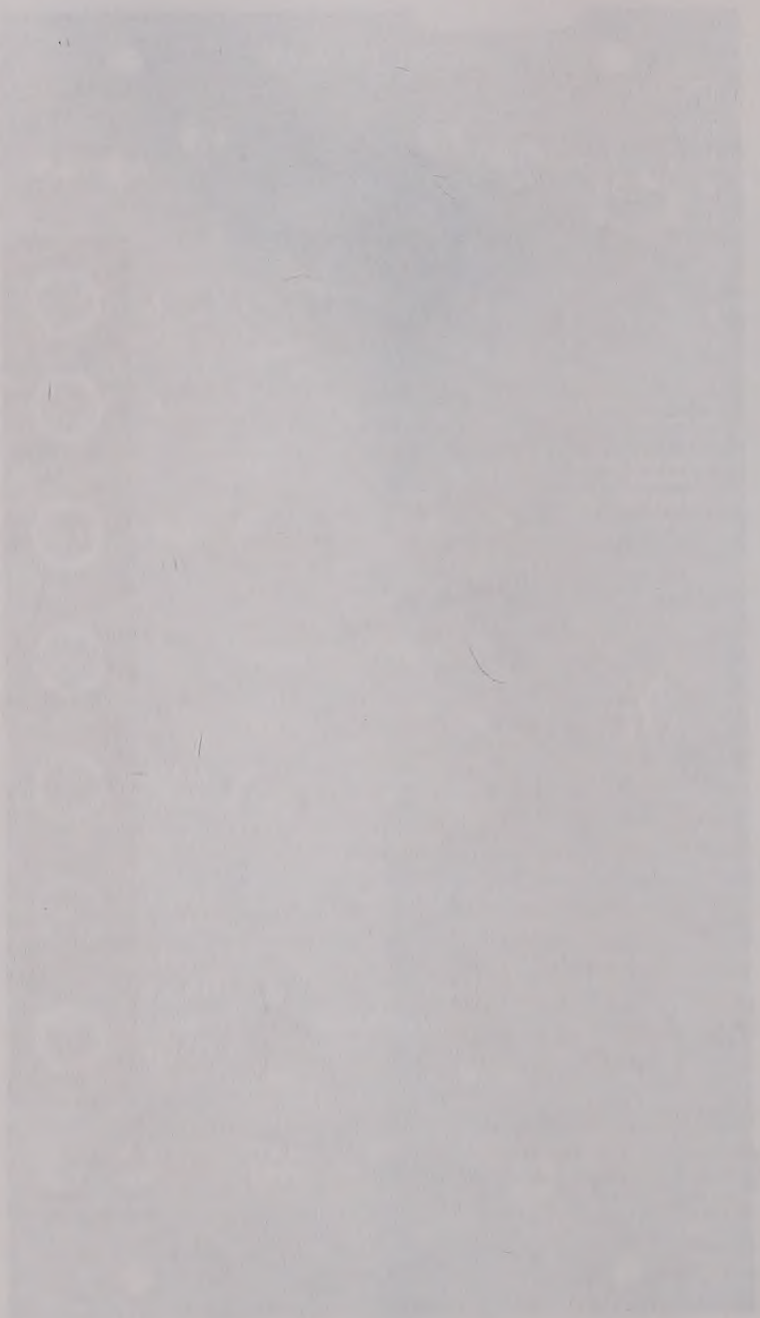
MODEL TTS-26BXP
5
6
4
7
3
8
2
9
1
PULSES
A
B
POSITION CABLE CONNECTOR TO ABOVE OUTLINE
LK
LP
DIR
ADJ % BRK
TL
RST
START
MAG TEST
CAL %BRK
SEND RLY TO TTS-26 REC LOOP
NORMAL
PR
MAG TEST

FIG-1



MODEL TTS 26BXP PULSING PANEL
ACCESSORY FOR MODEL TTS 26B PULSE SIGNALING TEST SET

OPERATING INSTRUCTIONS

1.0 GENERAL

1.01 The Model TTS 26BXP Pulsing Panel, in combination with the Model TTS 26BXC Circuit Panel, is used with the Model TTS 26B Pulse Signaling Test Set to provide groups of signaling pulses, or a continuous pulse train, through various leak, loop, and test circuitry. Such preset groups of pulses are useful for testing step by step switches and pulse correcting repeaters. A test also is provided to directly pulse the switch magnets of the step by step switch by the TTS 26BXP Panel. The face view of this panel is shown in Fig. 1. Figure 1A shows the schematic circuit of the panel.

1.02 Jack designations are consistent with the markings on various types of instruments that have been used in the industry. Jacks are provided in the TTS 26BXP panel for connecting to the pulsing and measuring circuits available in the TTS 26B. A cord with a 5 pin lock-in type connector associated with the accessory panel provides 48 volts and other essential interconnections from the TTS 26B to the accessory panel circuits.

1.03 Jacks are provided in the TTS 26BXP for the magnet test and the test of pulse correcting repeaters, and for direct access to the SEND relay of the TTS 26B. The TTS 26BXPC Control Unit or its Western Electric equivalent, the 36B test set, is connected by a cord and plug to jacks in the TTS 26BXP panel. These control units have push buttons for controlling the pulses sent through the established leak or loop circuit to operate the step by step switches and pulse repeater circuits and a push button for restoring the circuit to normal.

1.04 The panel is mounted in the detachable accessory cover adjacent to the TTS 26BXC panel. Internal interconnections are provided through a common terminal board within the cover. The cover is the same size as the case for the TTS 26B., i.e. 14" w, x 10" h, x 6" deep. When the accessory cover is equipped with a complete set of three modules, it adds about 10 pounds to the weight of the TTS 26B.

1.05 The TTS 26BXPC Control Unit is equipped with its own cord and a 241 type plug on one end, which plugs into the A and B jacks of the panel. A tip-ring-sleeve cord with a 310 type or equivalent plug on each end is required for the connection between the SEND RLY TO TTS 26 jack of this panel and the SEND RELAY jack of the TTS 26B. A 2-conductor cord (tip and ring) with a 310 type or equivalent plug on each end is required to patch between the TO TTS 26 REC LOOP jack of this panel and the REC LOOP jack of the TTS 26B. A 3-conductor cord with a 310 type or equivalent plug on the end toward the panel is required for use with the TL jack of this panel, for tests which use this jack. The remaining jacks make use of 2-conductor cords (tip and ring) with a 310 type or equivalent plug on the end of the cord toward the panel. Because of current carrying limitation cords with tinsel conductors, frequently used for 2-conductor cords, are not satisfactory for the connection between the MAG TEST jack and the magnet of the step by step switch.

2.0 PERFORMANCE DATA

2.01 The Model TTS 26BXP Pulsing Panel is designed to operate in conjunction with the Model TTS 26B Pulse Signaling Test Set and Model TTS 26BXC Circuit Panel to provide a specific number of pulses within a pulse train to a circuit under test. The operating parameters of this unit are as follows:

Maximum % break - 80% (at 12 pps)

Minimum % break - 40% (at 12 pps)

Operating Voltage - 48-55 volts DC

Number of pulses for a given pulse train - variable from 1-9 or continuous

Bias Switching (% Break)

2.02 Bias switching is accomplished internally to provide the proper % break (after initial adjustment) to correspond to the individual leak, loop, or magnet test functions as required.

SEND Relay Contacts

2.03 The SEND relay (located within the TTS 26B) is a high speed telegraph type relay. Representative units have driven a selector to the 9th level in excess of one hundred thousand times with no serious build up or deterioration of the SEND relay contacts.

Temperature

2.04 This unit is designed to operate satisfactorily over temperatures ranging from 30°F to 130°F.

3.0 CIRCUIT DESCRIPTION

3.01 The Model TTS 26BXP Pulsing Panel is normally operated in conjunction with the Model TTS 26BXC Circuit Panel, both of which are accessories to the Model TTS 26B Pulse Signaling Test Set. The main purpose of the TTS 26BXP unit is to provide the gating circuits required to apply 9 pulses to a circuit under test upon command. In addition, this unit performs the switching functions required to establish the various leak and loop conditions of the proper % break. Access to the leak and loop circuits in the TTS 26BXC is provided by an interconnecting harness. Access to the send and control circuits of the TTS 26B is provided by patching cords. This unit is normally placed in operation by depressing either the LP or LK button associated with the Model TTS 26BXPC Remote Control Unit. This control unit connects to the TTS 26BXP through a 12 foot cable. A circuit under test is released by depressing the RLS button on the remote control unit. A complete circuit diagram of the Model TTS 26BXP is shown in Figure 1A. Figures 2 through 10 are simplified schematics showing only the circuitry associated with given functions. The operation of this unit is as follows.

3.02 Prior to operation, connections and calibrations must be performed as outlined in Section 4.0. The above having been accomplished, the Model TTS 26B is now supplying continuous pulses at the speed and % break established. In the idle condition the pulses generated by the DRIVE relay within the TTS 26B are applied to the armature to relay STP; however, as STP is in a released condition, these pulses cannot be applied to any of the gating circuits. In the idle condition relay CMP is normally operated, thus extending ground via the CLAMP LEAD to the SEND relay within the TTS 26B. This ground circuit maintains the SEND relay in a steady off hook (closed loop) condition. For normal loop pulsing the contacts of the SEND relay are switched to the input of the TTS 26BXC loop and leak circuits, and subsequent pulses generated by the SEND relay will be applied to the circuit under test through the leak and loop circuits of the TTS 26BXC.

3.03 When key switch S1 is in the MAG TEST position, a make contact of the SEND relay is switched to the ring of the MAG TEST jack and the armature of the SEND relay is connected to ground via a make contact of relay CMPP, thus ground and open pulsing are generated for magnet testing.

3.04 For calibration purposes key switch S2 is moved to the CAL % BRK position. In this position ground applied to the SEND relay via the CLAMP LEAD is interrupted by the contact of S2 and the SEND relay contacts are switched to the receive loop circuit of the TTS 26B. In this condition the SEND relay is now under direct control of the DRIVE relay and the output pulsing is now routed to the receive circuit to allow direct observation of the % break.

3.05 The PR position of S2 also interrupts the ground applied to the SEND relay via the CLAMP LEAD. The purpose of this

position is to allow a continuous pulse train to be applied to the circuit under test. In the NORMAL position of S2 pulses are applied to the circuit under test under control of the gating circuits. The number of pulses within a given pulse train is determined by the positioning of ROTARY switch S5. The pulses within a given train can range from 1 through 9, depending on the setting of switch S5.

3.06 The gating circuits of the TTS 26BXP are placed in operation by depressing either the LP or LK button on the remote control head. Either of these buttons, when depressed, will extend a ground circuit, originating at the contacts of the BUSY TEST relay BS within the TTS 26BXC unit, to the ST relay. Should the circuit under test be busy, the BS relay would be in an operated condition and no ground circuit would be established, thereby making it impossible to initiate any further testing. Assuming the circuit under test is free, the ground circuit established will operate START relay ST. Relay ST, operated, extends the battery through current limiting resistance to the START FOLLOW relay STF. The function of STF is to insure that the gating circuits will start in proper phase with the DRIVE relay to insure that the first pulses applied to the circuit under test will be of the same duration in time as those following. Relay STF, when operated, extends the pulsing circuit of the DRIVE relay to STEPPING switch RM; ground pulses generated by the DRIVE relay will now cause RM to step.

3.07 Prior to RM moving from its HOME position (RM is shown in the HOME position on the schematic), CLAMP relay CMP is maintained energized. In the case of normal loop pulsing CMP is not released until after RM has taken its third step. Simultaneously with the first operation of RM, OFF HOOK relay OH is operated. The operation of relay OH completes the loop circuit, thus extending an off hook condition to the circuit under test. The duration of this off hook condition will be equal to three operations of the RM stepping switch. This off hook period is necessary to satisfy the requirements of the switch circuits under test. Stepping switch RM, when leaving its third position, removes ground from the coil of CMP, thus allowing it to release. CMP released removes ground from the CLAMP LEAD, hence from the SEND relay. The SEND relay will now follow pulses generated by the DRIVE relay, in turn generating DC interruptions on the loop circuit. These DC interruptions will continue until such time as stepping switch RM is caused to step from position 11 to position 12 (home). Upon returning to its home position, ground appearing on the wiper of RM is again extended to the CMP relay, which in turn applies ground to the CLAMP LEAD, thus stopping the SEND relay in an off hook condition. In the above operation, a total of 9 pulses have been transmitted to the circuit under test, assuming, of course, that ROTARY switch S5 is in position 9. Stepping switch RM, when returning to its home position, also applies ground through diode CR8 to the junction of R3 and R4, and the sustaining voltage for START FOLLOW relay STF is removed, allowing it to release. As STF is now released, further pulsing of RM is not

possible until such time as a new start command is received. It should be noted that OFF HOOK relay OH remains energized over its own locking contacts to the ground circuit established by the BS relay; thus the circuit under test is held in an off hook condition. The circuit is returned to on hook by pressing the RLS button momentarily. The RLS button, when depressed, applies ground to the OH relay side of R17, thus allowing it to release, in turn interrupting the loop circuit to return it to on hook.

3.08 In conjunction with the above operation, other relays such as LK1, LK2, LK3, and LP perform such functions as establishing the proper % break and the switching in and out of the various leak and loop conditions as required. The operation of these relays will be explained in more detail later. The function of the diodes used in the various circuits is to provide circuit isolation as required. Switches S3 and S4, which are located on the main panel, are provided to allow starting and resetting of this unit in the absence of the remote control unit. It should be kept in mind that when starting the unit with START switch S3, the % break of the pulses transmitted will be directly controlled by the adjust % break control located on the TTS 26B, and that the leak and loop values will be as indicated by the switch positions of the associated controls on the TTS 26BXC.

3.09 DIR jack J3 provides for direct access to the pulsing relay. This jack is equipped with disconnect springs to remove any leak or loop conditions established by the TTS 26BXC, if applicable. When jacking into J3, a ground circuit is established in lieu of that normally supplied by the BS relay within the TTS 26BXC.

Magnet Testing

3.10 Magnet testing is performed by moving key switch S1 to the MAG TEST position. A functional diagram showing the circuit arrangements for this mode of operation is shown in Figure 2. The magnet of the switch under test must be jacked into MAG TEST jack J5. The loop circuit of the switch under test connects to the R, LP, XS, RLY jack of the TTS 26BXC. This places the loop circuit of the switch under test in an off hook condition (assuming that circuit to be free prior to depressing the LK button). If that circuit is not free, the BS relay will operate, rendering any further testing impossible.

3.11 With reference to Figure 2, it can be seen that CLAMP FOLLOW relay CMPF is now brought into operation. The function of CMPF is to extend ground to the SEND relay during the period when the SEND relay contacts are open and prior to the transmission of the first ground pulse to the magnet under test. It should be noted that under normal loop operation a closed loop or off hook condition is established by relay OH when the SEND relay contacts are closed.

3.12 Several other circuits are also switched when moving S1 to the MAG TEST position. These circuits are associated with the operation of relay CMP and relay CMPF. This switching is necessary to provide the proper timing between the operation of relay CMP and the drive pulses as delivered by the drive relay. This timing must be different from that of normal loop operation, as the SEND relay must be placed in operation approximately 180° earlier in time than for normal loop operation. If this timing were not shifted, and the CMPF and OH relays were to operate during the off hook duration of the send pulse, a portion of a ground pulse would be applied to the magnet under test. This switching insures that the SEND relay will be in an on hook condition during the period that relays OH and CMPF perform their switching to extend the ground circuit to the SEND relay. Thus, under this condition, the first pulse applied to the magnet under test will be of proper duration. It is also necessary that the ground circuit to the SEND relay be removed upon the completion of the last ground pulse transmitted to the magnet under test. This is accomplished by releasing relay CMPF at the proper time. Depending on the position of switch S5, ground will be extended via the arm of stepping switch RM and the RM contact of RM to relay CMPF, thus causing it to release at the proper time. Capacitor C2, which is switched into the coil circuit of relay CMP under MAG TEST operation provides a delay in the release of relay CMP to insure that the release of CMP will be in the proper phase relationship with respect to the operation of the drive relay. Capacitor C3 in the coil circuit of relay CMPF prevents CMPF from operating momentarily, while stepping switch RM is moving to its home position prior to the operation of CMP.

3.13 Certain % break of the pulses transmitted under NORMAL LOOP or MAG TEST operation must be established. The % break associated with the various leak, loop, or MAG TEST conditions are shown in the table in the upper lefthand corner of the overall schematic. Initially the % break of 60.5% is established by the adjustment of the ADJUST % BRK control on the TTS 26B. All % break adjustments are conducted with key switch S2 in the CAL % BRK position. This position of S2 interrupts the CLAMP LEAD ground from the SEND relay, which allows it to follow the pulse grounded by the drive relay, and switches the SEND circuit of the TTS 26B directly to its own receive circuit. In this condition the % break of the pulses generated can be read directly on the % break meter. Figure 3 shows the major circuits established for the 60.5% break adjustment. It should be noted that prior to this adjustment the RLS button should be depressed in order to release any of the LK or LP relays which may have been previously operated, in which case bias shifting circuits contained within the TTS 26BXP would be switched in parallel to the bias circuits within the TTS 26B. With reference to the table, it can be seen that a % break of 60.5% is associated with the transmission of pulses when leak is inserted.

3.14 In the MAG TEST mode of operation, ground and open pulses at 67% break must be supplied to the magnet under test. With

reference to Figure 4, it can be seen that depressing the LK button associated with the remote control unit will cause relay LK2 to energize. Relay LK2, when energized, will complete the circuit for bias adjust resistor R16. This control should now be adjusted to obtain a reading of 67% break. It should be noted that the circuit selector switch on the TTS 26BXC is shown in the NORMAL position for this adjustment. This switch, when the leak A, B, or C position, applies ground to the coil circuit of relay LK2 to prevent its operation; otherwise, a % break of 67% would be realized under normal leak testing. Relay LK1 establishes a holding circuit for relay LK2; otherwise LK2 would release upon release of the LK button associated with the remote control unit. Relay LK3 does not perform any significant function in the MAG TEST mode of operation.

3.15 The major circuits to provide 68.5% break of the pulses generated for loop operation are shown in Figure 5. It can be seen that, when depressing the LP button associated with the remote control unit, relay LP will operate. The operation of LP switches bias adjust resistor R15 into the bias circuit. This control should be adjusted to provide a reading of 68.5% break.

3.16 The send circuit conditions established for leaks A, B, and C are shown in Figure 6. For leaks A, B, and C relay LK2 is held in a de-energized condition by the ground circuit established by deck A8 within the TTS 26BXC unit. (Should LK2 be allowed to operate, a % break of 67% would be established rather than the required 60.5%). In the LEAK C position of the circuit switch relay LK3 is maintained in a de-energized condition in the same manner as relay LK2 above. Preventing operation of relay LK3 allows the loop resistance of the TTS 26BXC to remain in the circuit when depressing the LK button, thus applying both leak and loop to the circuit under test. This condition is only established when depressing the leak button with the circuit switch in the LEAK C position. It should be noted that in this condition relay LP does not operate, thus the leak circuits remain established. The circuits established when depressing the LEAK button with the circuit switch in the LEAK C position are shown in Figure 7.

3.17 The circuits established by operating the LP button are shown in Figure 8. Depressing the LP button operates relay LP. Relay LP inserts bias adjusting control R15 to establish the required 68% break and switches out the leak circuits established by the circuit switch within the TTS 26BXC.

3.18 A simplified circuit diagram of the gating circuits as switched for normal loop operation are shown in Figure 9. The simplified circuit for the gating circuits as switched for magnet testing is shown in Figure 10.

4.0 CONTROLS AND JACKS

4.01 PULSES Switch. This switch controls the number of pulses (1-9) in a group which this panel will send at the preset speed and % break, following a momentary depression of either the LK or the LP push button of the TTS 26BXPC Control Unit, or its equivalent, the Western Electric 36B. Under other conditions, as discussed in subsequent paragraphs, continuous pulses instead of groups of pulses may be obtained for calibrating purposes and for pulsing through the leak or loop condition which has been established.

4.02 CAL % BRK Key. After proper interconnections have been established between the accessory cover and the TTS 26B, and after the set has been put in operation and properly adjusted, operation of this key permits calibration of the desired % break at the desired pulse speed. Subsequently, under control of the push buttons on the TTS 26BXPC Control Unit the required % break for the leak or loop condition is established automatically. The TTS 26BXP panel is then conditioned to send a group of pulses, the number of which is set by the PULSES switch, for either the leak or loop condition, under control of the LK and LP push buttons, respectively, of the TTS 26BXPC Control Unit. The PR position of this key provides for the continuous pulsing of circuits under test when the LK or LP push button of the control unit is depressed momentarily, or when the START push button on the panel is depressed momentarily. Depression of either the RLS push button on the TTS 26BXPC or the RLS push button on the panel stops the pulsing.

4.03 MAG TEST Key. When this key is operated to MAG TEST and the CAL % BRK key is at NORMAL, the group of pulses as set up by the PULSES switch at the previously established % break value is sent into the magnet of a step by step switch under control of the appropriate LK or LP push button.

4.04 START Push Button. This push button, when depressed momentarily, sends the group of pulses as set up by the PULSES switch at the previously established speed and at the % break value applicable for local tests. This is available at the jacks of the TTS 26BXP and TTS 26BXC Panels.

4.05 RST Push Button. This push button restores the step by step switch being tested to normal and releases the internal circuits within the TTS 26BXP panel.

4.06 ADJ % BRK AND LP Controls. These adjustable controls are used to set the values of % break required for calibration, magnet, leak, and loop tests, respectively, to the precise values called for in the circuit requirements.

4.07 A and B Jacks. The A and B jacks are used by the TTS 26BXPC Control Unit or the equivalent Western Electric 36B test set to initiate the tests and to control the % break associated with the

leak or loop test. The knurled side of the plug on the connecting cord goes toward the A jack (if a Western Electric 36B test set is used, the knurled side of the plug should be toward the A jack, or the cord should project toward the left).

4.08 DIR Jack. This jack gives access to the output of the pulsing circuit without passing through the TTS 26BXC circuitry.

4.09 TL Jack. This jack is used in circuits requiring a "busy" test followed by a "ground forward" on the sleeve to the circuit under test. The tip and ring circuits of this jack are internally connected to the tip and ring of the R, LP, SX, RLY jack of the TTS 26BXC panel, to provide the loop and leak circuits as required.

4.10 MAG TEST Jack. This jack is used for pulsing directly into the magnets of step by step switches.

4.11 SEND RLY TO TTS 26 and TO TTS 26 REC LOOP Jacks. As the designations indicate, these jacks are for patched interconnections between the TTS 26BXP panel and the TTS 26B set.

5.0 CALIBRATION

5.01 The calibration of this unit is dependent upon the individual tests to be conducted; therefore, the calibration procedure has been made part of the operating procedure outlined under Section 6.0.

6.0 OPERATION

6.01 The following is the procedure for pulsing step by step switches through leak and loop circuits simulating the actual circuit conditions under which these switches operate, using the TTS 26BXP, TTS 26BXPC, and TTS 26BXC with the TTS 26B.

On the TTS 26B

(1) Turn the right hand turn button to SPARK SUP OFF and the left hand turn button to RT on 1 and 2.

(2) Set the RECEIVE switch at REC LOOP and the SEND switch at SND LOOP-REC LOOP.

(3) Plug a 2-conductor cord (tip and sleeve) with a 310 type or equivalent plug on the end toward the set into the appropriate 48 volt jack of the set. (This should precede connection to battery to avoid blowing a fuse when the plug is inserted.) Then connect the other end to 48 volt office battery (48 to 55 volts). This step is omitted when the TTS 26BXPS Power Supply is included in the accessory cover and AC power is used.

(4) Plug the connector plug on the cord from the accessory cover into the EXT ADAPT socket and lock it in.

(5) Set the METER CIRCUIT switch at % BREAK DIRECT.

(6) Operate the TEST SEND key to SEND OSC. (The TWD-L and TWD-D keys remain normal.)

(7) Turn the PULSES PER SEC switch to 12. LINE (E) and DROP (M) lamps should light.

(8) With a 3-conductor cord having a 310 type or equivalent plug on each end, patch from the SEND RLY TO TTS 26 jack of the TTS 26BXP Panel to the SEND RELAY jack of the TTS 26B.

(9) With a 2-conductor cord (tip and ring) having a 310 type plug on each end, patch from the TO TTS 26 REC LOOP jack of the TTS 26BXP panel to the REC LOOP jack of the TTS 26B.

(10) Turn the FUNCTION switch to CAL METER and adjust the METER CAL control to read 0 % BREAK on the meter scale.

(11) Turn the FUNCTION switch to SEND and REC. Do not attempt to use the ADJ % BREAK position for adjustment of the % break. The other switches on the TTS 26B are not involved.

(12) Plug the TTS 26BXPC control plug into the A and B jacks of the TTS 26BXP panel, with the knurled side toward the A jack. (If a Western Electric 36B Test Set is used, the cord on its plug should be to the left or its knurled side should be toward the A jack.)

(13) On the TTS 26BXPC or the Western Electric 36B momentarily depress the RLS button.

(14) On the TTS 26BXP operate the CAL % BRK key. The MAG TEST key should be at NORMAL.

(15) On the TTS 26BXC set the CIRCUIT switch at NORM and the LOOP RESISTANCE switch and ADD key at 0. The other keys and controls on the TTS 26BXC panel are not involved in the calibration.

(16) Adjust the ADJ % BREAK control of the TTS 26B to obtain a reading of 60.5% break on the meter. This step establishes the % break value for the leak tests.

(17) On the TTS 26BXPC or Western Electric 36B momentarily depress the RLS button, then the LP button. Note the meter reading on the TTS 26B.

Requirement: It should read 68.5% break. If it does not, adjust the LP control on the TTS 26BXP until it does.

(18) On the TTS 26BXPC or Western Electric 36B momentarily depress the RLS button, then the LK button. Note the reading on the TTS 26B.

Requirement: It should read 67% break. If it does not, adjust the LK control on the TTS 26BXP until it does. This step may be omitted when magnet tests are not required (67% break is required only for magnet tests).

(19) On the TTS 26BXPC or Western Electric 36B momentarily depress the RLS button.

(20) On the TTS 26BXP panel restore the CAL % BRKkey to NORMAL.

(21) Patch the circuit to be tested on the R, LP, SX, RLY jack of the TTS 26BXC panel with a 3-conductor cord having a 310 type or equivalent plug on the end to be inserted into the TTS 26BXC.

(22) On the TTS 26BXC turn the CIRCUIT switch to the desired position (e.g. LKA) and the LOOP RESISTANCE switch and ADD key to the desired value (e.g. 1400). (The "A" RELAY

RESISTANCE switch and control and the "A" RELAY and REC CKT keys are not in the test circuit for these tests in the R, LP, SX, RLY jack.)

NOTE: If a check of the % break calibration (60.5%) is desired, operate the CAL % BRK key of the TTS 26BXP for this purpose. If a check of the % break being sent out from the R, LP, SX, RLY jack is desired, this jack may be patched temporarily into the REC LOOP jack of the TTS 26B. For this check, loop resistance and leak must be switched out of the unit and a minimum of 7 pulses must be sent to obtain an accurate reading. A reading of 67% break should be obtained with the CIRCUIT switch in the NORM position and the LK button depressed; this % break is associated with magnet testing and is established when the CIRCUIT switch is in the NORM position and in other positions of the CIRCUIT switch. Under loop testing conditions the % break established by depressing the LK button is 60.5% break except when the CIRCUIT switch is in the NORM position; in this position 67% break will be established.

(23) Set the PULSES switch on the TTS 26BXP at the desired number. Refer to the chart in Figure 1 for the % break as related to the circuit conditions established. To establish other values of % break for leak and loop tests, insert the desired value for the leak tests in Step 16 and the desired value for the loop in Step 17. These units are designed for operation down to 42% break (Step 16) and up to 78% break (Step 17).

6.02 As shown in Figure 2 of the TTS 26BXC manual, other tests may be made using the RCX jack for sending pulses, and also other jacks and key operations to set up various circuit arrangements for receiving pulses. The DIR jack of the TTS 26BXP panel provides direct access to pulses from the TTS 26BXP without passing through the leak and loop circuits.

6.03 To continue the switch test covered by paragraph 6.01 with a test of the switch magnet, replace steps 21 through 23 of that paragraph as follows:

(21) With a 3-conductor cord having a 310 type or equivalent plug on the end toward the test set patch from the R, LP, SX, RLY jack of the TTS 26BXC panel to the proper switch jack contacts to seize the A relay of the switch to be tested.

(22) With a 2-conductor cord (tip and ring) having a 310 type or equivalent plug on the end toward the test set patch from the MAG TEST jack of the TTS 26BXP panel to the magnet under test. Only the ring is used for

connection to the magnet. Because of current carrying limitations, cords with tinsel conductors, as frequently used for 2-conductor cords, are not satisfactory for the connection between the MAG TEST jack and the magnet of the step by step switch.

(23) Set the PULSES switch on the TTS 26BXP at the desired number (e.g. position 5 to check 5th level).

(24) On the TTS 26BXP operate the MAG TEST key (the CAL % BRK key remains at NORMAL). The test is applied by momentarily depressing the LK button on the TTS26BXPC unit. This first places a holding loop across the A relay (if the circuit is not busy) which, in operating, removes the A relay from the pulsing path to permit making the magnet test and causes the switch to be made busy. A series of 1 to 9 ground pulses are than transmitted to the magnet under test, the distortion of the pulses normally supplied by the A relay being eliminated. The % break of the pulses is 67% when the CIRCUIT switch on The TTS 26BXC is in the LK A position and 60.5% when in the LK B position.

(25) When it is desired to pulse two digits, as in the case of connectors, the LK button is held depressed long enough to start the second group of pulses.

6.04 When it is desired to send continuous pulses using the TTS 26BXP instead of groups of pulses, the CAL % BRK should be operated to PR, and the LK or LP button on the TTS 26BXPC depressed momentarily to establish the loop and/or leak conditions desired and start pulsing. The pulsing may be stopped and the circuits returned to on hook by momentarily depressing the RLS button on the TTS 26BXPC or the RST push button on the panel.

6.05 For some tests on incoming selectors the required % break when the LK button of the TTS 26BXPC is depressed, is 45% instead of 60.5% (see Step 16 of paragraph 6.01), and the % break when the LP button of the TTS 26BXPC is depressed (following operation of the RLS button in each case) is 78% instead of 68.5% (see Step 17 of paragraph 6.01). There is sufficient range in the LK and LP controls of the TTS 26BXP and the ADJ % BREAK control of the TTS 26B to permit these adjustments.

6.06 To use the sending jacks of the TTS 26B it is not necessary to remove the lock-in connector from the EXT ADAPT socket, but merely to disconnect the patch from the SEND RLY TO TTS 26 jack of the TTS 26BXP to the SEND RELAY jack of the TTS 26B, and depress the RLS push button on the TTS 26BXPC or the RST push button on the panel.

Pulse Repeater Tests

6.07 To test pulse repeaters and pulse correction circuits the following procedure is typical. For these tests the % break when the LK button on the TTS 26BXPC is depressed shall provide 40% break instead of 60.5% break (see Step 16 of paragraph 6.01), and the % break when the LP button of the TTS 26BXPC is depressed (following the operating of the RLS button in each case) shall provide 75% break instead of 68.5% break (see Step 17 of paragraph 6.01). There is sufficient range in the LK and LP controls on the TTS 26BXP and the ADJ % BREAK control on the TTS 26B to permit these adjustments. The battery supply voltage must be at least 48 volts for these tests.

6.08 If continuous pulsing of these circuits is desired, the CAL % BRK key should be in the PR position. For the above tests a tip-ring-sleeve cord with a 310 type or equivalent plug on the end toward the test set should be plugged into the R, LP, SX, RLY jack on the TTS 26BXC. The other end should be equipped with the appropriate plug as required for connecting into the pulsing input of the circuit under test.

6.09 To measure the output of the circuit under test connect the circuit directly to the receive circuits of the TTS 26B. The appropriate receive circuits must be selected by the RECEIVE switch on the TTS 26B (the SEND and REC switch must not be moved from the SND LOOP-REC LOOP position).

Use of RST and START Buttons

6.10 Tests requiring only a single % break, as determined by the ADJ % BREAK control on the TTS 26B, may be initiated and released through the use of the RST and START push buttons on the TTS 26BXP. Loop or leak conditions may be inserted for these tests by setting the CIRCUIT and LOOP RESISTANCE switches on the TTS 26BXC as required. The TTS 26BXPC Control Unit is not required for these tests.

6.11 For those circuits requiring a "ground forward", the circuit under test should be connected to the TL jack on the TTS 26BXP. The circuitry associated with the sleeve of this jack will apply a ground to the sleeve of the circuit under test upon depressing either the LK or LP button (this is assuming, of course, that the circuit under test is not busy). This ground circuit will remain on the sleeve until such time as the RLS button is depressed.

7.0 MAINTENANCE

7.01 The TTS 26BXP Pulsing Panel does not require any routine maintenance. It is therefore not recommended that this unit be removed from the case until such time as malfunctions occur. Extreme care should be exercised when removing or replacing this unit within its case. The connecting cables should be carefully routed to insure that there will be no interference between the connecting cable and any mechanical parts such as the relays, stepping switch, etc.

7.02 The basic test equipment for servicing this unit, if a malfunction occurs, should include a Brush or other similar type of pen or electric writing recorder. This is necessary to observe the sequential operation of the various timing and relay circuits within the unit. The circuit description of this unit also serves as a trouble shooting procedure.

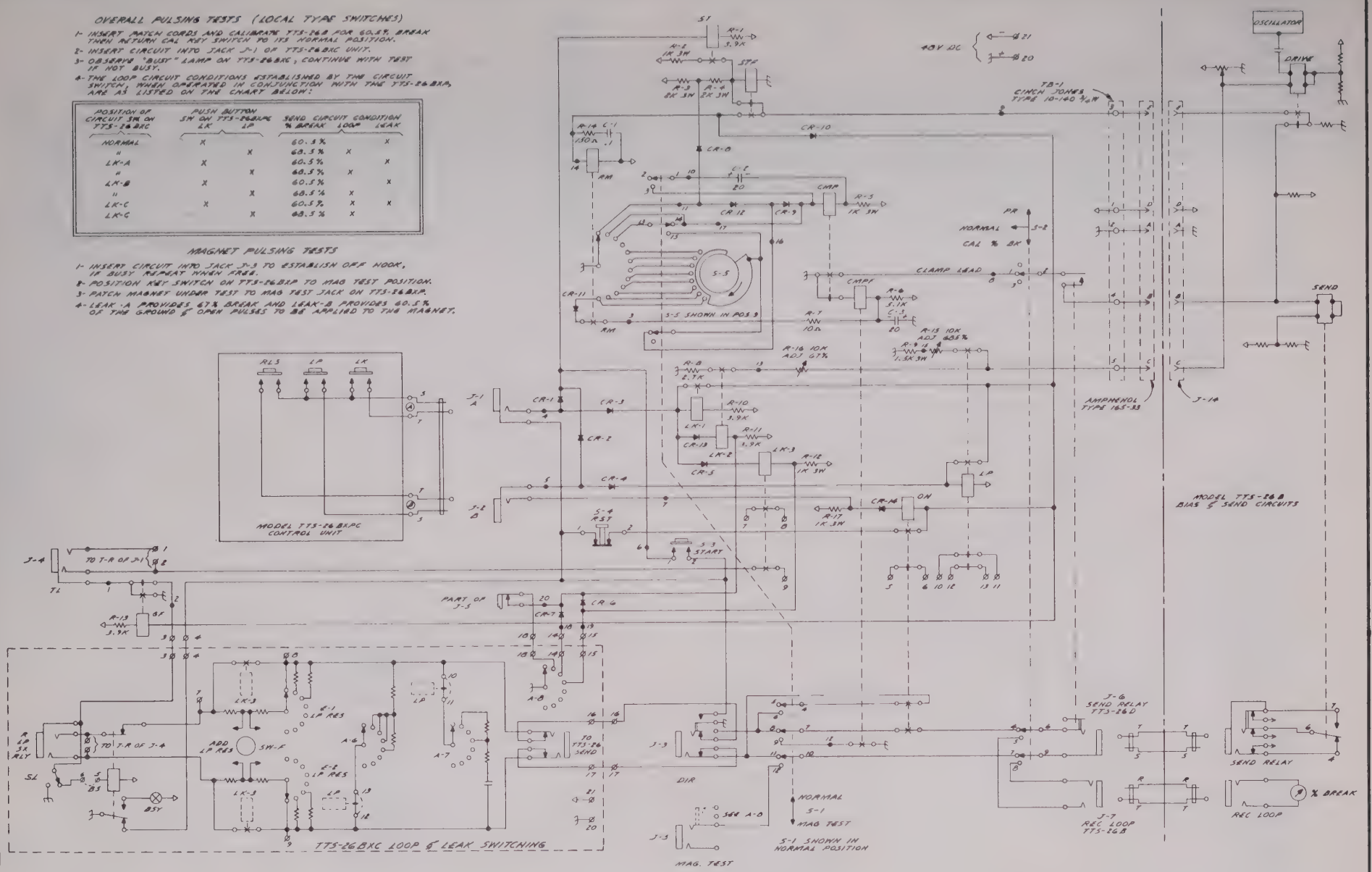
OVERALL PULSING TESTS (LOCAL TYPE SWITCHES)

1- INSERT PATCH CORDS AND CALIBRATE TTS-26B FOR 60.5% BREAK THEN RETURN CAL KEY SWITCH TO ITS NORMAL POSITION.
2- INSERT CIRCUIT INTO JACK J-1 OF TTS-26BXC UNIT.
3- OBSERVE "BUSY" LAMP ON TTS-26BXC, CONTINUE WITH TEST IF NOT BUSY.
4- THE LOOP CIRCUIT CONDITIONS ESTABLISHED BY THE CIRCUIT SWITCH, WHEN OPERATED IN CONJUNCTION WITH THE TTS-26BXP, ARE AS LISTED ON THE CHART BELOW:

POSITION OF CIRCUIT SW ON TTS-26BXC	PUSH BUTTON SW ON TTS-26BXP LK	LP	SEND CIRCUIT CONDITION % BREAK	LOOP	LEAK
NORMAL	X		60.5%		X
"		X	68.5%	X	
LK-A	X		60.5%		X
"		X	68.5%	X	
LK-B	X		60.5%		X
"		X	68.5%	X	
LK-C	X		60.5%	X	X
LK-C		X	68.5%	X	

MAGNET PULSING TESTS

1- INSERT CIRCUIT INTO JACK J-3 TO ESTABLISH OFF HOOK, IF BUSY REPEAT WHEN FREE.
2- POSITION KEY SWITCH ON TTS-26BXP TO MAG TEST POSITION.
3- PATCH MAGNET UNDER TEST TO MAG TEST JACK ON TTS-26BXP.
4- LEAK -A PROVIDES 67% BREAK AND LEAK-B PROVIDES 60.5% OF THE GROUND & OPEN PULSES TO BE APPLIED TO THE MAGNET.



NOTES:
Ø = TERMINALS ON INTERCONNECTING TERMINAL BLOCK TB-2 (CINCH JONES TYPE 21-140 3/4 W)
ALL DIODES IN089.
ALL RES. 1/4W UNLESS STATED OTHERWISE.

MODEL TTS-26BXP PULSING UNIT

FIG. 1A

REVISED 2-2-67
REVISED 8-13-66

SEND CIRCUIT CONDITIONS FOR MAGNET TESTING. % BK = GT WITH CIRCUIT SWITCH IN LEAK A AS SHOWN. POSITIONS B & C PROVIDE 60.5 % BK WHEN DEPRESSING THE LK BUTTON.

NOTE: LK-2 IS NOT OPERATED IN LEAK B & C POSITIONS OF THE CIRCUIT SWITCH. THUS 60.5 % BK IS ESTABLISHED FOR B & C LEAK POSITIONS. THESE LEAK CONDITIONS ARE NOT APPLIED TO THE MAGNET UNDER TEST.

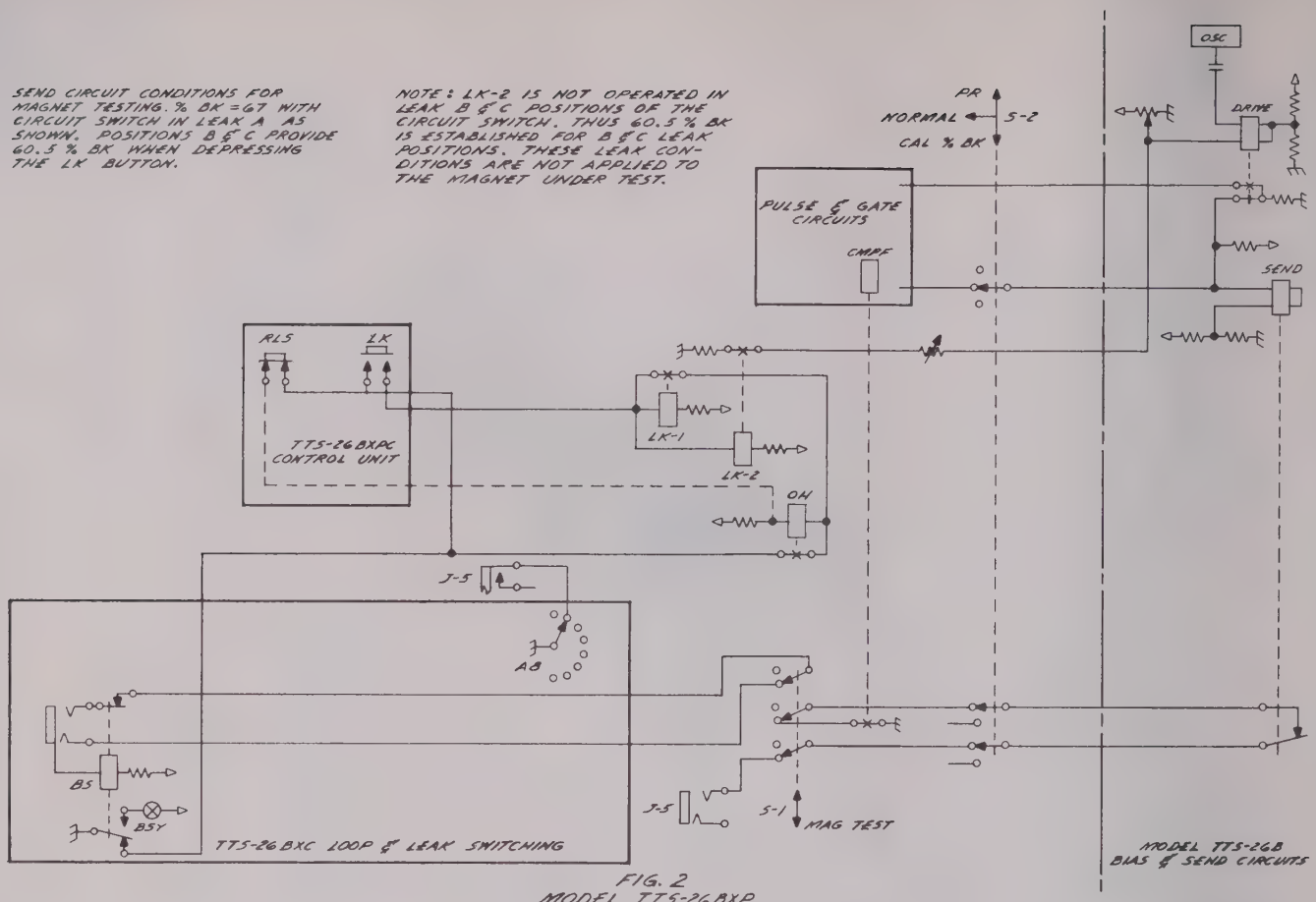
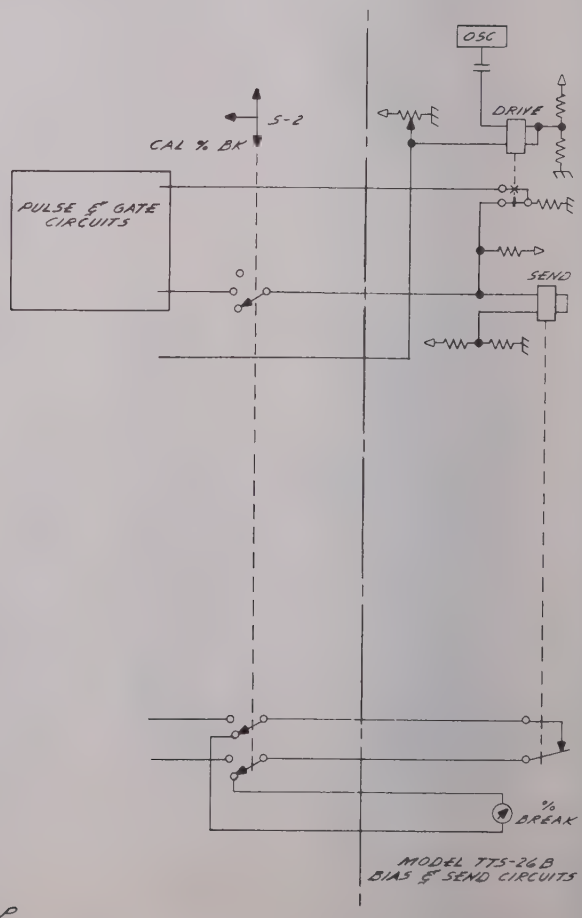


FIG. 2
MODEL TTS-26BXP



CAL % BREAK 60.5 %

DEPRESS RLS BUTTON PRIOR TO THE FOLLOWING ADJUSTMENT TO RELEASE THE LK OR LP RELAYS. ADJUST TTS-26B TO 60.5 % BK. (60.5 % BK IS USED IN CONJUNCTION WITH LEAK TEST FUNCTIONS)

FIG. 3
MODEL TTS-26BXP

CAL % BREAK 67 %
FIRST DEPRESS THE RLS BUTTON THEN DEPRESS LK AND ADJUST THE LK TRIMMER TO OBTAIN A READING OF 67 % BK (67 % BREAK IS USED FOR MAGNET TESTING ONLY)

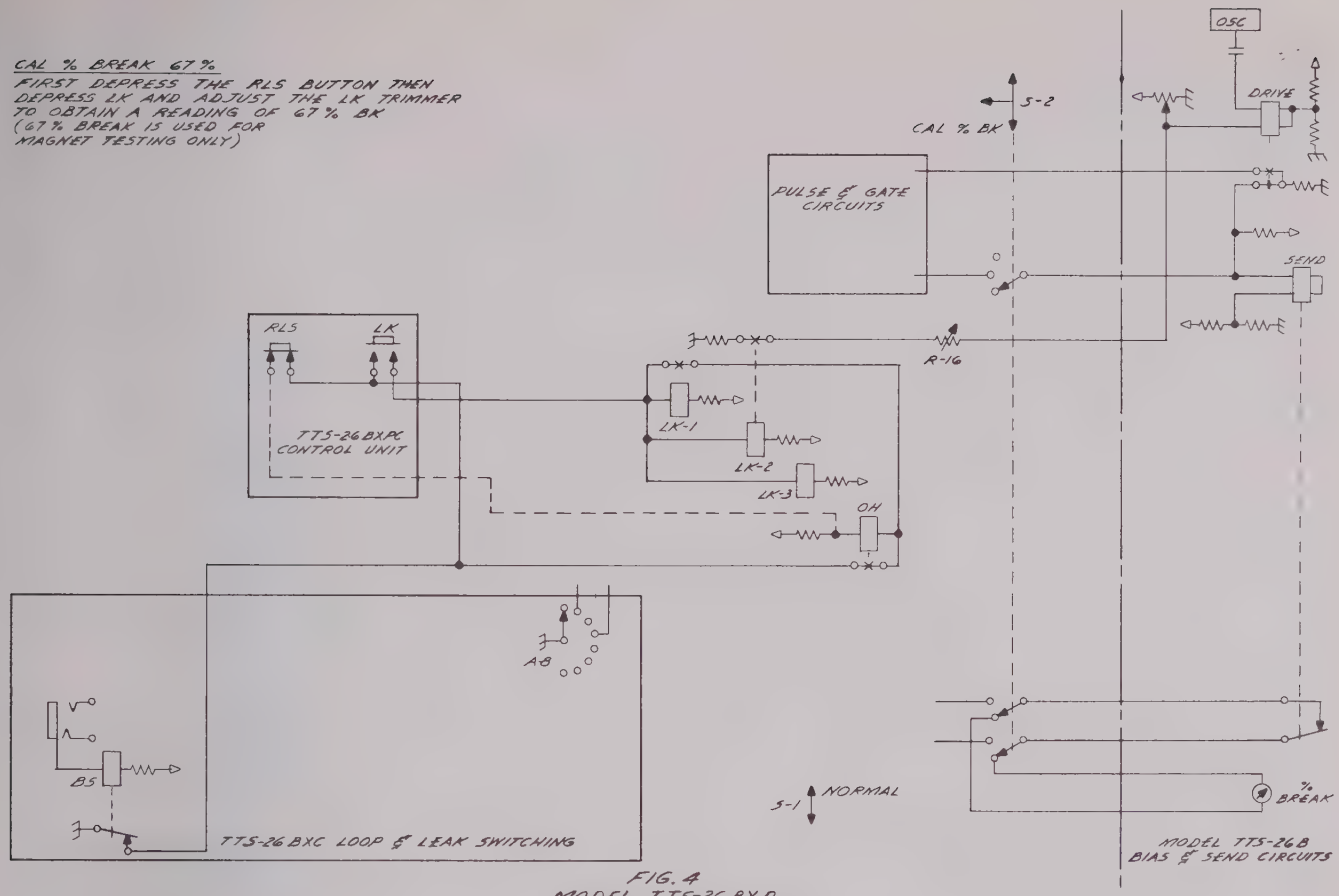


FIG. 4
MODEL TTS-26 BXP

CAL % BREAK 68.5 %
FIRST DEPRESS THE RLS BUTTON THEN DEPRESS LP AND ADJUST THE LP TRIMMER TO 68.5 %. (68.5 % BREAK IS USED WITH LOOP TEST FUNCTIONS.

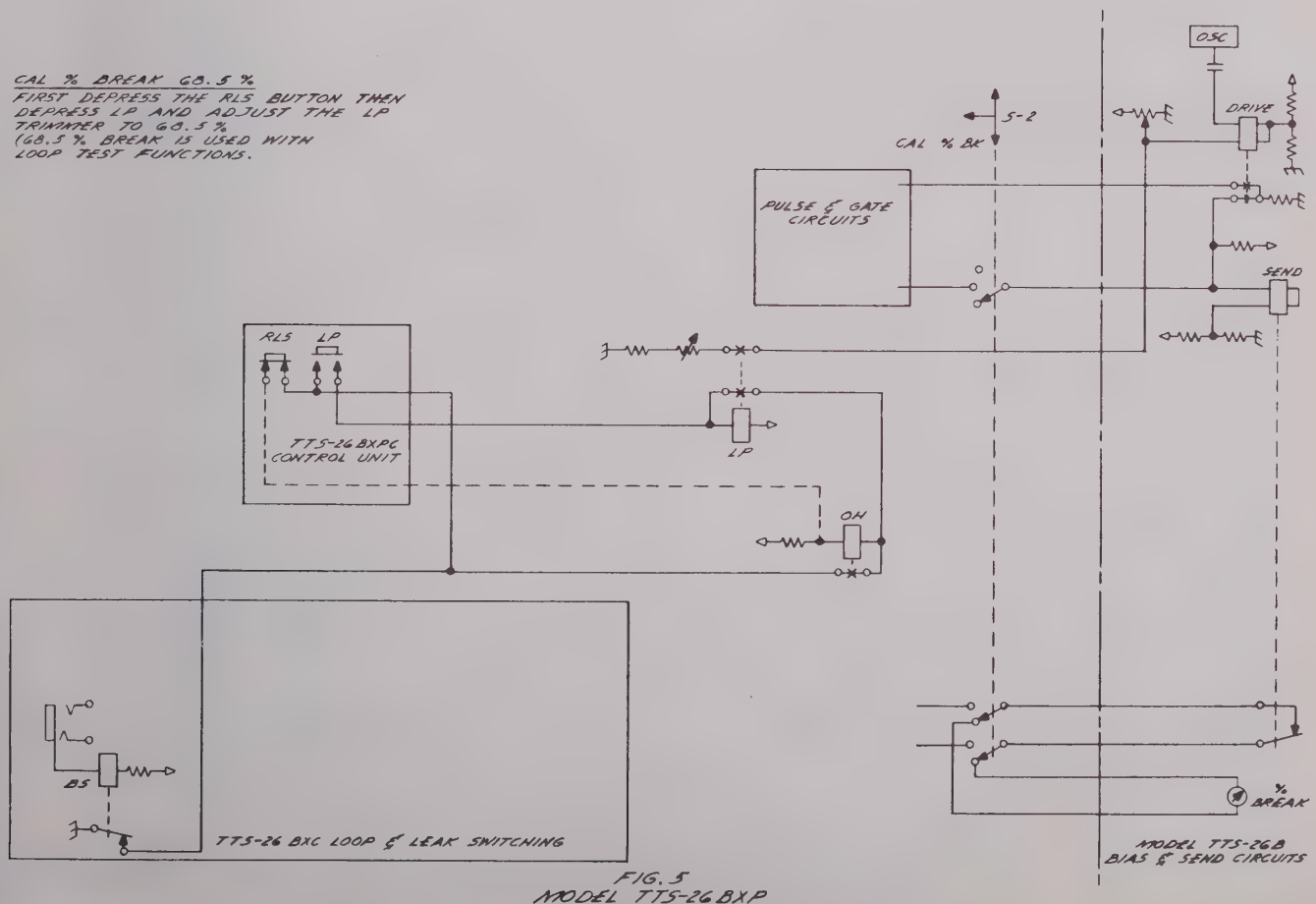


FIG. 5
MODEL TTS-26 BXP

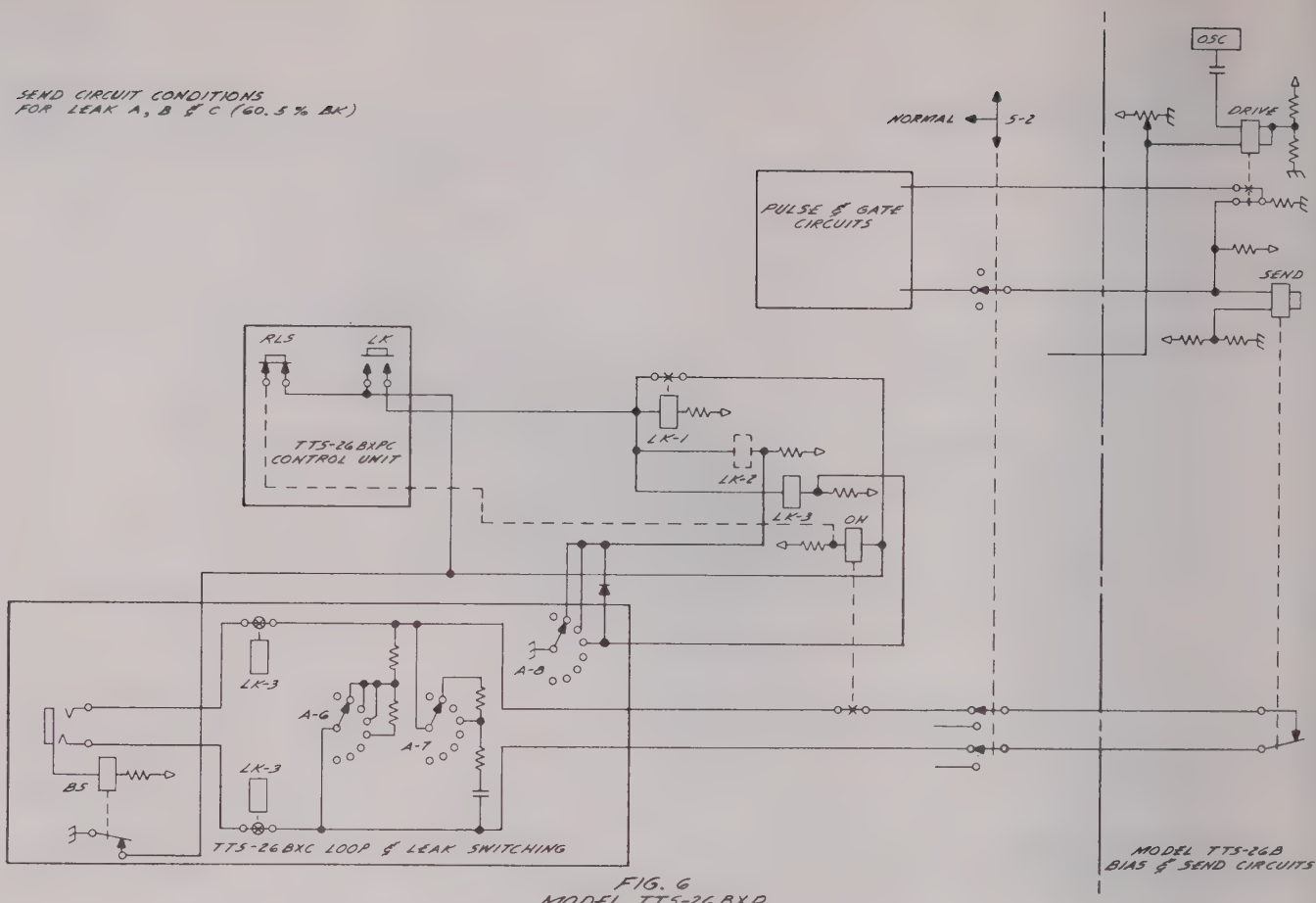


FIG. 6
MODEL TTS-26BXP

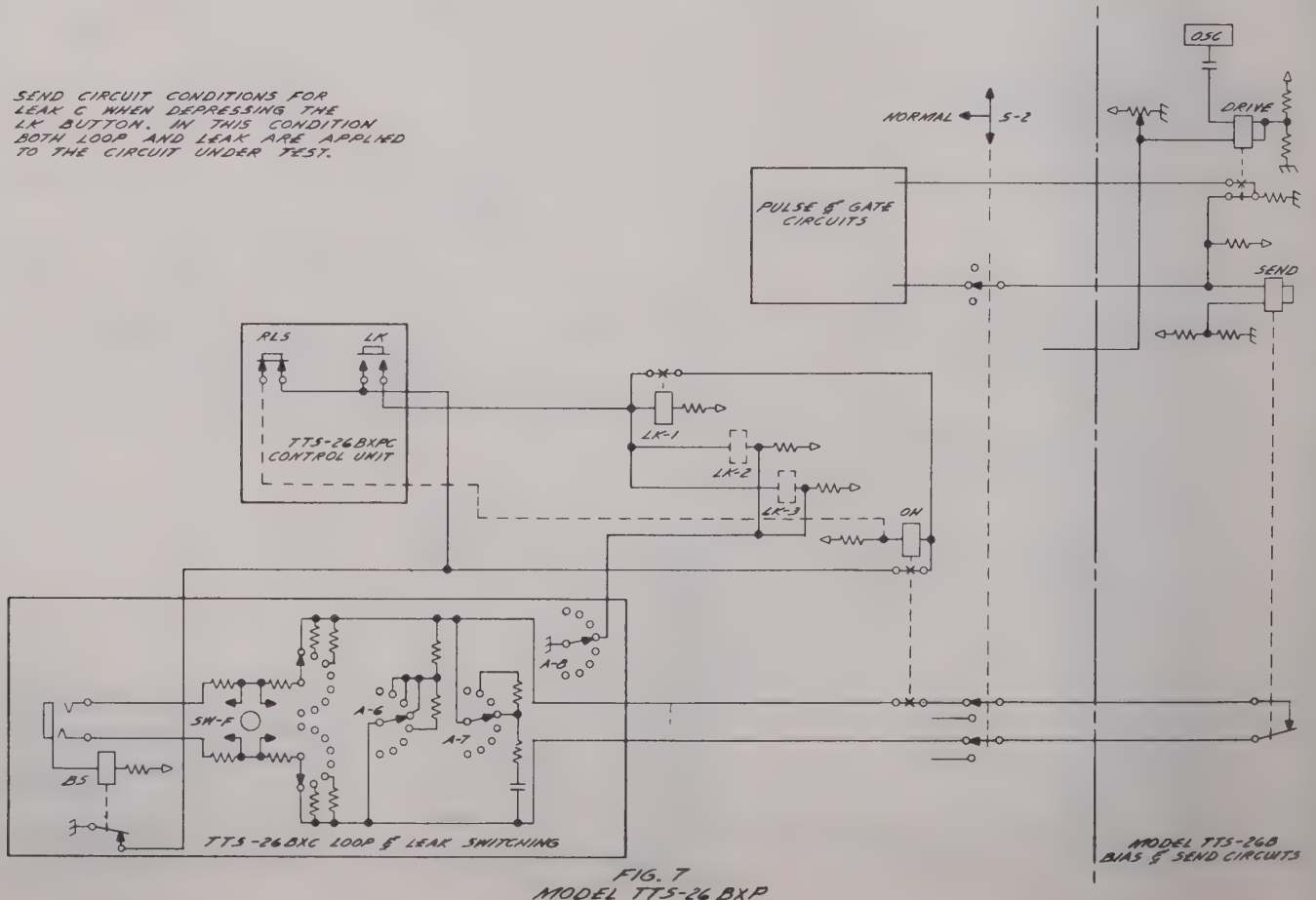


FIG. 7
MODEL TTS-26BXP

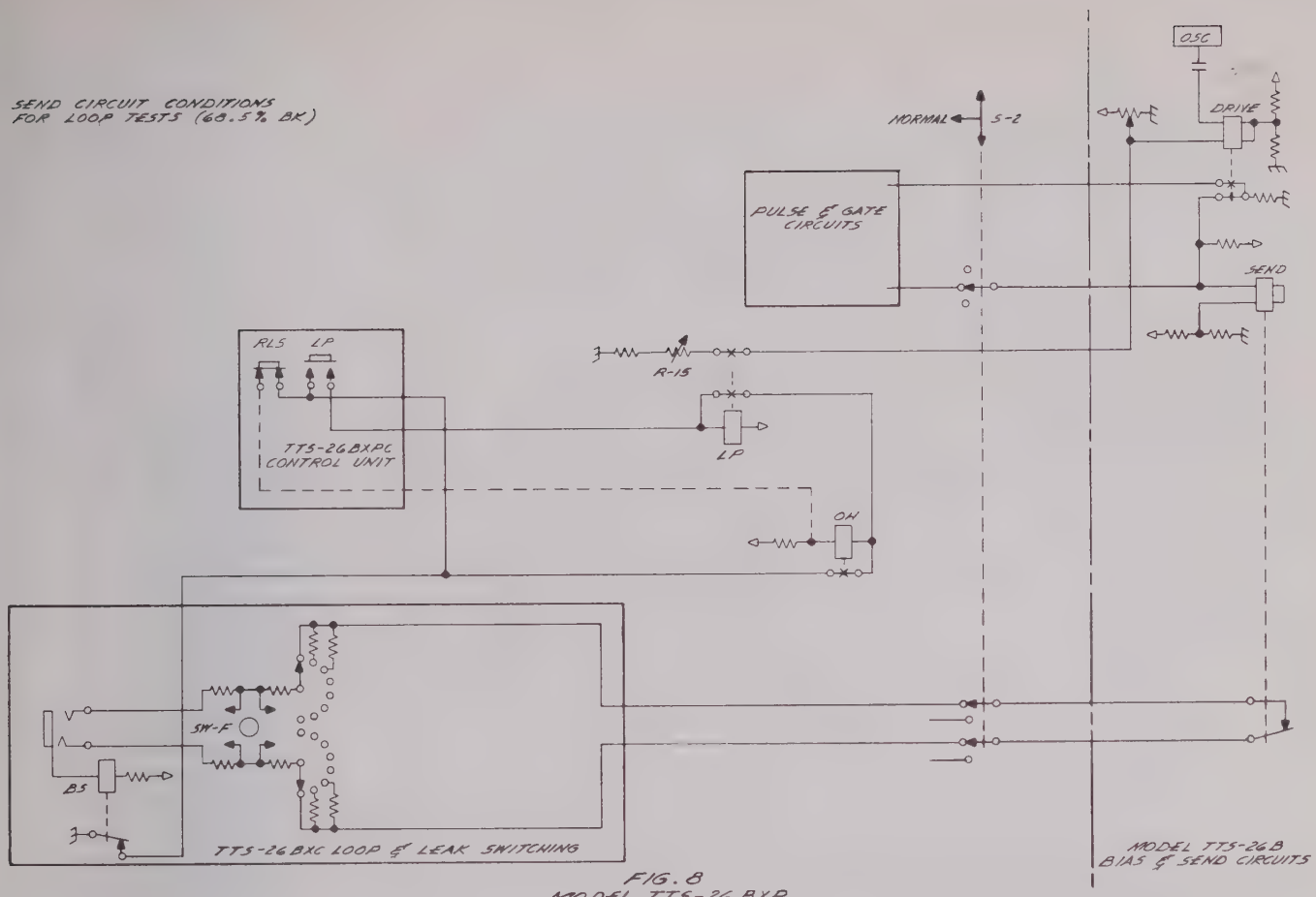


FIG. 8
MODEL TTS-26BXP

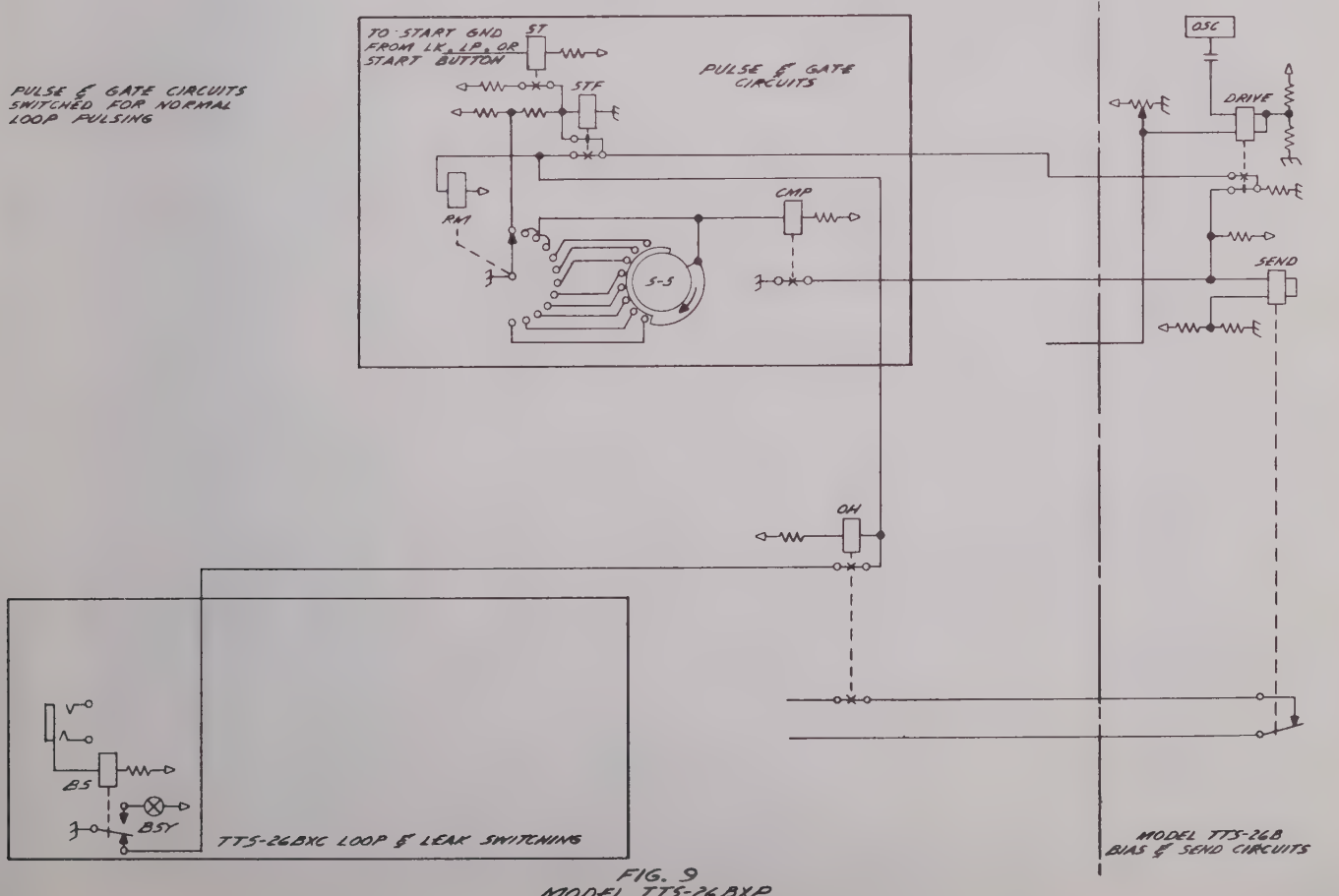


FIG. 9
MODEL TTS-26BXP

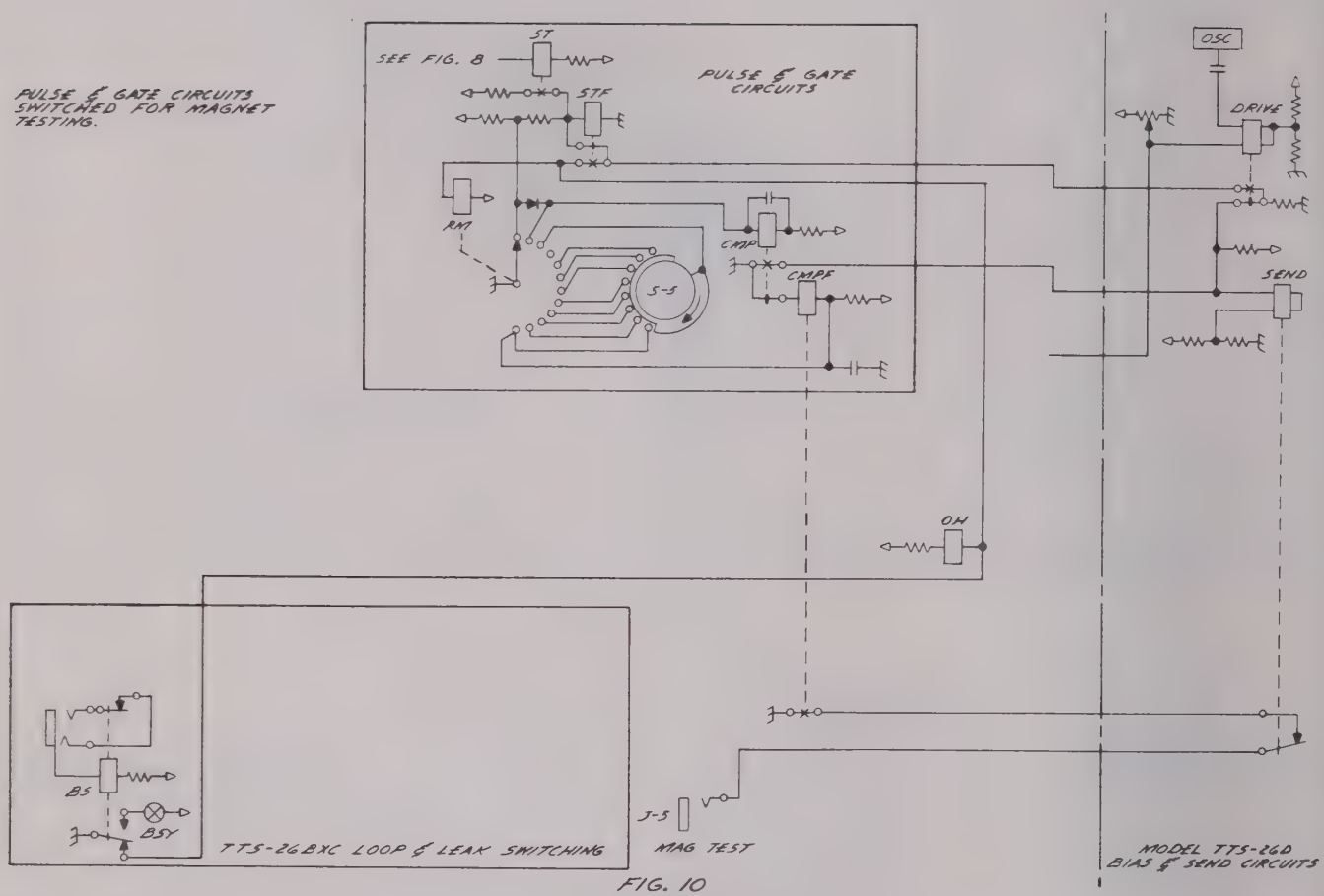


FIG. 10
MODEL TTS-26BXP

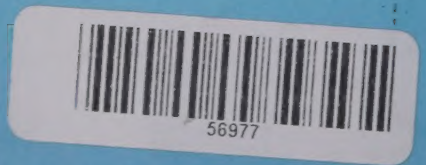
TABLE OF REPLACEABLE PARTS

Circuit Ref	Description	Mfr* & Mfr's Designation
C1	Capacitor: fixed, ceramic, 0.1 mfd, 75 vdc	B, DDA-104
C2	Capacitor: fixed, electrolytic, 20 mfd, 50 vdc	H, TE-1305
C3	Capacitor: fixed, electrolytic, 20 mfd, 50 vdc	H, TE-1305
R1	Resistor: fixed, composition, 3.9 K ±5%, ½ w	A, RC-20
R2	Resistor: fixed, wirewound, 1 K ±5%, 3 w	H, 242E-1025
R3	Resistor: fixed, wirewound, 2 K ±5%, 3 w	H, 242E-2025
R4	Resistor: fixed, wirewound, 2 K ±5%, 3 w	H, 242E-2025
R5	Resistor: fixed, wirewound, 1 K ±5%, 3 w	H, 242E-1025
R6	Resistor: fixed, composition, 2.7 K ±10%, ½ w	A, RC20
R7	Resistor: fixed, composition, 10 ohms ±10%, ½ w	A, RC20
R8	Resistor: fixed, composition, 2.7 K ±10%, ½ w	A, RC20
R9	Resistor: fixed, wirewound, 600 ohms ±5%, ½ w	F, 4414
R10	Resistor: fixed, composition, 3.9 K ±5%, ½ w	A, RC20
R11	Resistor: fixed, composition, 3.9 K ±5%, ½ w	A, RC20
R12	Resistor: fixed, wirewound, 750 ohms ±5%, 3 w	F, 4418
R13	Resistor: fixed, composition, 3.9 K ±5%, ½ w	A, RC20
R14	Resistor: fixed, composition, 150 ohms ±10%, ½ w	A, RC20
R15	Resistor: variable, wirewound, 10 K	C, AW10000
R16	Resistor: variable, wirewound, 10 K	C, AW10000
R17	Resistor: fixed, wirewound, 750 ohms ±5%, ½ w	F, 4418
J1	Jack: telephone	J, 5J-1194MT
J2	Jack: telephone	J, 5J-1194MT
J3	Jack: telephone	J, 5J-1191CMT
J4	Jack: telephone	J, 5J-1329
J5	Jack: telephone	J, 5J-1191CMT
J6	Jack: telephone	J, MT333
J7	Jack: telephone	J, 5J-1329
S1	Swith: key, telephone, 2 position	I, 170K
S2	Switch: key, telephone, 2 position	I, 173E
S3	Switch: push button, SPDT	I, 903
S4	Switch: push button, SPDT	I, 903
S5	Switch: rotary, 9 position	B, PA2042
RM	Switch: rotary	G, GW-1124
LK1	Relay: 2500 ohm coil, 1C	G, RS5D
LK2	Relay: 2500 ohm coil, 1C	G, RS5D
LK3	Relay: 24 volt, coil, 4C	G, KHP17D11-24
ST	Relay: 2500 ohm coil, 1C	G, RS5D
STF	Relay: 2500 ohm coil, 1C	G, RS5D
CMPF	Relay: 2500 ohm coil, 1C	G, RS5D
GF	Relay: 2500 ohm coil, 1C	G, RS5D
LP	Relay: 48 volt coil, 4C	G, KHP17D11-48
CMP	Relay: SPDT, 24 volt coil	E, W103MPCX-4
CR1-CR14	Diodes: silicon	K, 1N2069
	Knob: For S5	D, 647-3L-BB
	Knob: For R15 and R16	D, 645-3-BB

*See List of Manufacturers Code Letters for Replaceable Parts Table

LIST OF MANUFACTURERS CODE LETTERS

Code Letter	Manufacturer
A	Allen-Bradley Company
B	Centralab Electronics
C	IRC, Inc.
D	Kurz-Kasch, Inc.
E	Magnecraft Electric Company
F	Ohmite Manufacturing Company
G	Potter and Brumfield
H	Sprague Electric Company
I	Stromberg-Carlson
J	Switchcraft, Inc.
K	Sylvania Electric Products, Inc.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